POPULAR MECHANICS

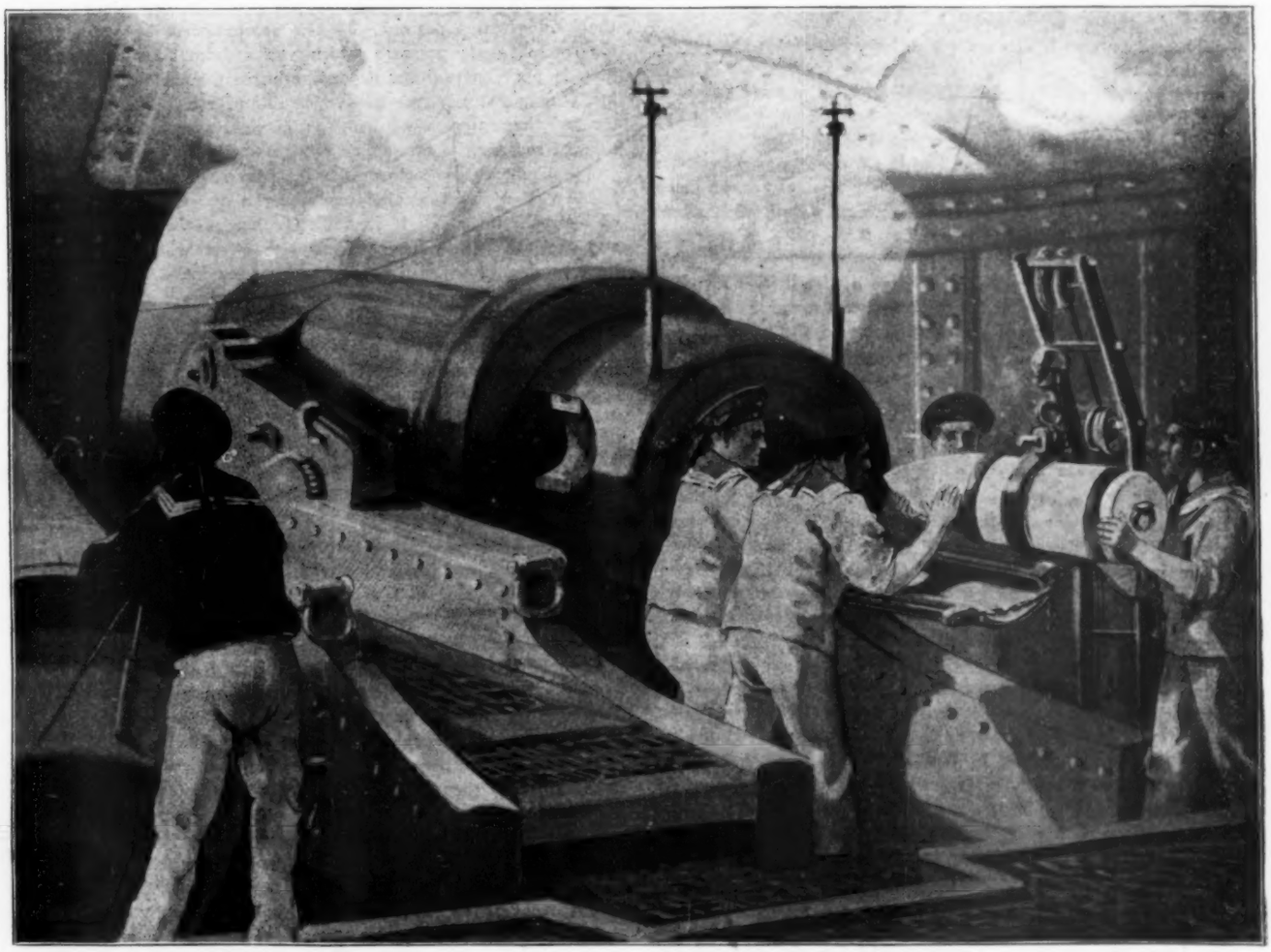
Smithsonian Institution

An Illustrated Weekly Review of the Mechanical Press of the World

"Tells you how to do things." Written so you can understand it

Vol. 3. No. 2. CHICAGO, JANUARY 10, 1903. PRICE 5 CENTS

Germans Bombarding Venezuelan Fortress



Scene on Board the Cruiser Vineta During the Destruction of Fort Salano and Castle Libertardo

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SMITHSONIAN DEPOSIT

UNITED STATES INTERVENTION IN VENEZUELA.

Arbitration Proposal May Have Prevented a Disastrous Struggle Between the Old and New Worlds.

The front page illustration shows the forcible methods that were being employed by European powers to settle their disputes with Venezuela, when the United States stepped in and reminded them of The Hague tribunal, which the powers themselves had created for just such controversies. The friendly offices of the United States may have been given additional weight by the presence of Admiral Dewey and a fleet of 40 powerful war vessels cruising down in the Caribbean. The question has not yet been settled and doubtless will not be until Germany and England have decided to their own satisfaction just the amount of strain the Monroe doctrine will stand. That is the object which, nearly all thinking Americans believe, prompted Germany and England to make the rather strenuous demonstration against the weak little nation of Venezuela.

The illustration is from a snap shot taken from the interior of the German cruiser Vineta during the bombardment of the fortress at Puerto Cabello. The German ship was assisted by the English cruiser, Charybdis. Fort Solano and Castle Libertardo, composing the fortress, returned the fire but the Venezuelan guns were soon silenced and the fortress was demolished. During the bombardment the wildest excitement reigned in the Venezuela town. Every house was closed and the inhabitants rushed aimlessly through the streets.

Prior to the bombardment the British commodore sent a detachment of marines and took charge of the British merchant steamer Topaze, which had previously been seized by a Venezuelan mob. The British sent a message to the authorities at Puerto Cabello demanding immediate satisfaction for the action of the mob in hauling down the British flag from the Topaze. President Castro at once issued instructions to give the British such satisfaction as they demanded, but before the answer could be communicated to the British the bombardment was begun, the forts destroyed and the first blood in the Venezuelan war was spilled. The forts were old fashioned structures built during the 18th century and could offer little resistance to the powerful and modern German and English cruisers.

The intervention of the United States in behalf of arbitration, civilization's method of settling such disputes, was at a perilous moment when the entire civilized world seemed on the verge of becoming embroiled in a disastrous struggle all over a quarrel with a little insignificant nation and a pittance of a claim. There seemed impending a clash of arms between the old world and the new. It looked as if every European nation, except our old "stand-by"—France—was to be arrayed against Uncle Sam. Of course in that event Mexico and all the Americas, north and south, excepting Canada, would have been aligned on our side. That there were ulterior motives in these demonstrations few thinking persons of the United States doubt, notwithstanding the surprise manifested by Germany and England at our suspicions. The Monroe doctrine prohibits the further acquirement of territory and interference by European powers with governmental affairs of any nation on the two American continents. Germany and Europe, undoubtedly, desired to know just what part of this doctrine holds good and what does not. The final decision, whenever it is reached, will be a precedent that will govern future action. The matter is not settled yet, however, and war still exists between Venezuela and the two European nations.

District Manager Morris of the Independent Telephone Company, successfully ended a strike of telephone girls at Washington, Ind., by means of a few boxes of caramels and chocolates. The girls demanded an advance in wages, and quit work. Morris arranged a conference, distributed the candy, and induced the girls to resume work, promising to take up the question of wages with them in the near future.

INCANDESCENT LIGHT FILAMENTS.

Although used so universally, very few, even of those who have spent years in the electrical business, have even seen an incandescent lamp in process of manufacture, says Cassier's magazine. The best absorbent cotton is generally used as the basis of the filament. The raw cotton is placed in a pot or vessel, treated with zinc chloride, and worked to a pulpy mass which permits of filtration, and is then carefully fitered through fine-mesh platinum filters. After being filtered several times the density is brought to the desired value for what is known as the squirting process. The "mass," as the pulpy material is called, is then placed in spheroidal-shaped vessels, which are provided with openings at both top and bottom. The lower ends are provided with platinum dies, the openings in which are of sufficient size to permit the passage of the mass and form it into a thread of a certain diameter, dependent upon the kind of lamp desired. This is accomplished by subjecting the mass to air pressure which varies from four to twelve pounds per square inch, depending upon the condition of the mass, temperature, atmospheric condition, etc. The temperature of the water-bath in which the vessels are placed at the time of squirting is about ninety degrees C.

The filament passes from the die into a glass jar which is filled with menthyl alcohol containing a 10 per cent solution of hydrochloric acid. It immediately hardens in this solution, and the acid neutralizes any alkaline effect which may have been retained from the zinc chloride treatment. At this point the filament is of a yellowish-white color, and as it slowly passes through the die and coils itself in the alcoholic solution it looks very much like vermicelli. After remaining in this solution for three or four hours the filament is washed in acid solutions, in pure distilled water, and finally in a bath of methyl alcohol, the entire washing process taking about twenty-four hours. It is then wound upon velveteen drums which are about eighteen inches in diameter, and is allowed to dry. When thoroughly dried it is cut to the desired lengths and the individual filaments are made up in bunches of ten or more. They are next wrapped around carbon forms to produce the desired shape.

These forms, each accommodating a number of filaments, are placed in a crucible and packed in graphite, there being first a layer of graphite, then a number of forms, etc., the top layer being graphite. The cover is then placed on the crucible and the whole is sealed, small openings being left for the escape of the gases which are driven off in the carbonizing process. The crucible is placed in the carbonizing furnace and the temperature is gradually raised to about 2,500 degrees Fahrenheit and maintained at this point for about twenty-four hours. The temperature is then raised to about 4,500 degrees Fahrenheit and kept at this point for several hours longer, after which the crucibles are allowed to cool slowly. The time occupied in the carbonizing process depends upon the size of the filaments, and for very large filaments may be much longer than the just-mentioned period. The crucible is finally unpacked and the filaments are removed, the graphite and forms being preserved for further use.

After having been sorted the filaments are again classified according to their electrical resistance, and are then ready for the "flashing process."

The earlier forms of filaments were far from being of uniform cross section, and the flashing process was introduced to render them more uniform. The process consists essentially in placing the filaments in a jar containing hydrocarbon vapor—generally gasolene or pentane—and raising them to incandescence by sending an electric current through them. The high temperature decomposes the hydrocarbon vapor, and pure graphite carbon is deposited upon the surface of the filament. If the latter is uniform the deposit occurs equally over all portions.

Makes Boiler Work Swift and Easy

Portable Pressure Accumulator, a Remarkable Device for Use With Small Tools

Small hydraulic tools can be handled to many times greater advantage with the aid of the portable air pressure accumulator, a device designed by a Kansas man to facilitate boiler making and repair. Work that formerly required the labor of three men, for 3½ hours with a screw punch, can now be done with the aid of the pressure accumulator in ten minutes with much less exertion. The accumulator's advantage appears most conspicuous in work in places formerly regarded almost inaccessible. The small shear is used in it for cutting off the square heads of button-headed radial stays, after the stays have been screwed into place. The heads were formerly cut off with the hammer and chisel, but the blow of the hammer loosened the thread in the crown sheet which had the bad effect of encouraging leaks. The shear is also useful in shearing off staybolts in throat sheets on top of radial stay boilers and in other places where it is inconvenient to manipulate the heavy staybolt clippers. The small hydraulic punch is used for punching holes which were formerly punched with a screw punch and many holes which were drilled, for instance, in the flanged corners of door and flue sheet, the flanges of firedoor hole and back head, the holes necessary to be punched in old boilers when they require patching and the holes in firebox sheet when half side sheets are being put in. With 100 pounds air pressure sufficient force may be generated in the accumulator for punching a 13-16-inch hole through ⅞-inch boiler steel. The Railway Master Mechanic says:

The appliance is mounted on a small four-wheel truck for portability and may be easily transferred to any point in or about the shop. The main cylinder is wrought pipe 13¼ inches in diameter with flanged heads on either end. Around the outside of the cylinder for about one-half of its length is a water space, storing the water used for hydrostatic pressure. A stuffing box is screwed into the top head of the main cylinder and into this is screwed a piece of hydraulic pipe 1¼ inches in diameter. In the brass cap at the top of this cylinder is the connection of the copper pipe leading to the tools. This copper pipe is flexible and is arranged with a ball and socket connection to the tool. The lower part of the upper cylinder or hydraulic pipe is connected through a pipe with water space, the connection to the water space being as near the bottom as possible. The small ¼-inch copper air pipe shown, is the connection by which water is forced from the water space to the upper cylinder. This pipe is caught over the top of the small cylinder in consideration of the fact that the tendency of water to seek its own level might otherwise fill this pipe with water which would flow back into the air connections. A piston operates in the main cylinder, its piston rod extending into the upper cylinder. Water having been forced into the upper cylinder and copper pipe connection, by the initial pressure in the air line, air is admitted below the piston, raising it and increasing the hydrostatic pressure in the upper cylinder by the upward movement of the piston. The piston and piston rod are both packed with leather.

Portable Pressure Accumulator.

Artificial tea, the kind which we generally drink for the real, is made by mixing oxide of iron with tea dust and rolled by means of starch into pellets resembling the genuine tea.

The Italians permit no wedding gifts that are sharp pointed, from which practice emanates our superstition that the gift of a knife severs friendship.

HOW TO MAKE CEMENT STEPS AND CURBS.

The use of cement has become so general, it can be used instead of other materials in so many places, and people are learning how to lay it themselves to such an extent, that the following directions by F. H. Crafts, in Municipal Engineering, will be found very useful:

The lower step is always laid first. A concave frame, seven or eight inches high, is useful in making steps with a convex "rise" or front. The face of the frame is planed smooth and sometimes painted with shellac. The second step laps over the one below.

When ready for the step, concrete is packed in behind the frame, but not against it. Rich mortar one inch in thickness is plastered along the face of the frame, a little at a time, to keep away the concrete, which is tamped all the time it is going in, great care being taken to make a good job. The tread of the step is finished, and as soon as the step is hard enough to stand alone, the frame is removed, and the face of the step finished with a steel trowel. The tread should be fourteen or fifteen inches wide when another step is to be laid above, and it is not necessary to finish a step back of the tread, as this part will be covered by the next step.

Where curbing is to be laid adjoining a cement walk, some days should be allowed to pass, to let the walk get hard and tough, before putting in the curb. Tar paper should be used to make the separation complete. The outside only of the curb is rich mortar; the interior is composed of concrete, the same as with steps, and mixed one to five. Around stores and railway stations the outer course of flagging sometimes acts as a curb, and is built in the same manner as a step, having a rise of seven or eight inches in front; and, to avoid danger of breaking, diminishing in thickness gradually from front to back. Even this may be broken by an asphalt improvement resting against the walk instead of going under it. In many places curves can be introduced with the finest effect, as in private grounds, around houses or in parks. Here ash ribbons are useful, in place of scantlings, in laying out the walks.

In order to prevent horses from slipping stable floors and driveways of artificial stone are usually marked across the surface with line or dot rollers. It is no benefit to a walk to have mortar plastered on the sides after the scantlings are removed, but at driveways one must either make an approach of concrete and top mortar or set in a stick of timber, or a three-inch plank, against the walk to protect it from carriage wheels.

Concrete head walls give a neat appearance to tile or iron pipe culverts along our improved roads and railways. The end tile is removed when the pit is made for head wall, and concrete two feet deep is laid to bed this tile properly; the tile is replaced and cemented around the junction with the next length. The open box is then set up for the head wall. The method of manufacture is much the same as for steps. Pieces of concave molding are placed in the vertical corners of the wooden boxes to avoid sharp edges on the finished walls. The box is taken to pieces after allowing twenty-four hours' time for the concrete to harden. Clean water is dashed over the wall, and a little neat cement mortar is put on the vertical surfaces with a plasterer's trowel, then carefully rubbed down with a wet whitewash brush. The job is completed by laying a concrete apron eight inches in thickness in front and around the head wall, both the head wall and apron having the upper surface finished with one inch of fine mortar, like the surface of a sidewalk.

Concrete coping upon stone retaining walls and other structures.—A good effect will be produced by making the blocks about six feet long, eighteen inches high, and having them project about four inches over the face of the stone wall with the vertical points very strongly marked. Only every other block (the first, third, seventh, etc.) is laid at first, the others being filled in later, after the first lot has hardened. In this manner, by using tar paper the blocks can be properly separated, and means be employed to mark the vertical joints.

Cement cellar floors.—The thickness of these should be three or four inches, and the concrete should be well tamped, then a thin coating of good mortar spread over the top. No joints are made, but the floor should be higher in the middle than at the sides. Usually a cinder foundation is needed.

The groovers are used on cellar floors for making gutters to lead the water around to the trap. If one can obtain finely broken stone, such as will pass through a screen with 121 meshes per square foot, it should be used with clean, sharp sand in making concrete. There should be some pieces of two-inch porous tile under the lowest part of a cement walk to carry water away.

Tools Used in Making Cement Steps.

Wooden covers ten feet long are useful to protect new walks from damage. They should be made so that one end will lap over the next cover six inches. Two or three tarpaulins, eight feet wide and twenty or thirty feet long, made of heavy, old sails are useful to throw over cement which is left over night on the work, when a rainstorm might ruin it. The cover is kept off the ground, raised high on planks with air circulating under it. In case of a sudden shower while one is laying a walk, the tarpaulin is thrown over covers raised high on empty barrels, thus protecting the walk while it is being finished, and keeping the rain away, which a leaky cover would not do. It is well worth while to use these precautions to save a walk from injury, as otherwise one may often lose fifteen or twenty dollars by a single rain storm.

Edgers of several designs are used to round off the edges of walks and head walls, and of still other forms on curbs. There are many designs of jointers to suit the taste of walk makers.

BRITISH WORKMEN'S WAGES.

Though wages are nominally lower in Great Britain than in the United States, they are in fact higher, considering the work actually done. The British workman's theory is that to prolong a job by doing it slowly makes more work. Under the operations of the trades union rules, the slowest worker sets the pace of his associates, no matter what their number may be.

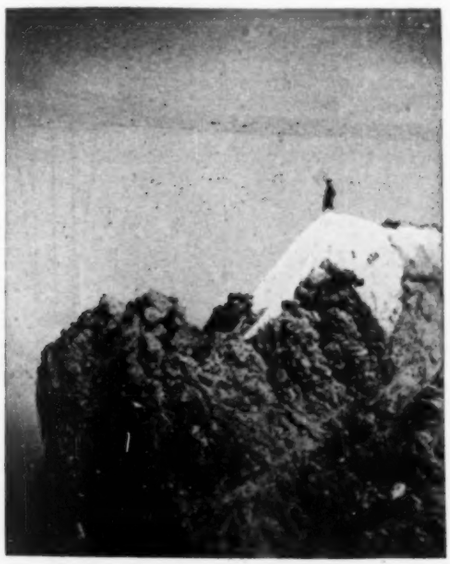
In Birmingham, Eng., the voters have defeated the proposition of J. P. Morgan's company to provide new electric roads and by 2,000 majority decided to support the city council in building city railways.

Mountain Climbing in America

Daring and Fascinating Sport May be Enjoyed to its Fullest Extent in Our Own Country

All the thrills required to make mountain climbing an alluring sport may be found in the Cascades of America without the necessity of going to far-away Switzerland. There are great peaks on this remarkable range of the Pacific coast that have defied the efforts of the most daring adventurers and whose cliffs yet remain unscaled. Along the lines of the Southern Pacific railroad may be found mountains that rise almost perpendicularly to dizzy heights and their summits are always covered with snow. One of the most picturesque of these is Mount Hood, which is seemingly gaining a greater reputation among European "climbers" than among Americans. Numerous parties have come from Switzerland, France, England and other parts of Europe to dare the dangers of this remarkable peak. In the accompanying illustration is shown a party of English tourists tugging up the snow cap near the summit. Mountain climbers when they go in parties always tie themselves together, so that if one slips and starts to fall he is held by the others. At times, however, entire parties have been swept to descruction through this method.

Summit of Mount Hood.



Topmost Point of Mount Hood.

Tourists Climbing Mount Hood.

WILL LOOK INTO MINT EMPLOYES.

Japan to Use X-Ray Machine to Detect Coin Swallowers.

Japan has discovered a novel use for the X-ray, and soon a most modern machine will be working as a detective in the mint in the mikado's realm.

An order on Queen & Co., an optical goods firm in Philadelphia, from the mikado of Japan has been placed through a representative who is buying various wares, from engines to needles, in this country. The Philadelphians have been commissioned to supply a complete set of X-Ray apparatus of improved design.

In explanation of the purpose for which the instruments are to be used the representative of Japan said that the mikado's mints had been robbed habitually by employes, who would surreptitously swallow the newly minted coins. All sorts of devices to prevent this system of loot had been tried in vain until the director of the imperial mints, with oriental ingenuity, decided to bring science to play the part of detective.

As soon as the Philadelphians can ship the machinery to Tokio suspected employes will be "X-rayed" each day.

IT WAS COTTONSEED OIL.

An Austrian material for preventing the rising of dust on sweeping proves to be cottonseed oil. In the test at Vienna, it was found that floors oiled twice a year could be swept weekly without any whirling of the dust, and the material was recommended for all rooms where many people were received, as well as for laboratories, libraries and other places to be kept scrupulously dust free.

"Kape alive, Mike; we're rescuin' ye!"

Voice from the debris: "Is big Clancy up there wid ye?"

"Sure he is."

"Ast him wud he be so kind as t' step aff the rooins. I've enough on top av me widout him."

Popular Mechanics

Published by Popular Mechanics Co.
Journal Building, - - - Chicago

SUBSCRIPTION

United States, Canada, Mexico and all U. S. Possessions, per year.....$2 00
Foreign Countries, post paid..... 3 00

Long Distance Telephone Main 2682

Make Remittances by Draft, Money Order or Registered Letter. Address,

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Journal Building, - - Chicago

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This Issue 20,000 Copies

Advertisers are invited to examine our books at any time. We tell the exact truth about our circulation and have nothing to cover up.

POPULAR MECHANICS IS ONE YEAR OLD.

Popular Mechanics is one year old with this issue. When the first issue was published, Jan. 11, 1902, there were just five paid subscribers on the subscription list. This issue will be mailed to 14,000 paid subscribers. The news stand sales have grown in the one year from 500 to 6,000 a week. This makes the circulation reach a total of 20,000 a week. We know of no instance where this record of a first year has been equalled by any weekly journal ever publishd. At the same rate of progress the circulation will have increased to 50,000 in another year.

Readers of the first issue of Popular Mechanics searched in vain for the usual announcement of the great things the new paper was to accomplish. All they found were the two lines:

"Tells you how to do things."
"Written so you can understand it."

These mottoes have steadily been adhered to and always will be. The appearance of Popular Mechanics in a new field of journalism was enthusiastically welcomed. From every state and territory and all the new possessions of the United States; from Canada, Mexico, South America, South Africa and Europe; from every foreign land where the English language is spoken, have come to us expressions of warmest approval.

From manufacturers and buyers, from factory superintendents and factory employes; from farm implement dealers and users of farm implements; from inventors and users of inventions; from technical instructors and technical students; mine operators and miners; ship owners and sailors; naval officers and marines; army officers and soldiers; from business men, doctors, lawyers, ministers, farmers, civil and mechanical engineers, from superintendents, principals, teachers and pupils of city, country and high schools, and from people of every possible avocation there came a like response when it was known that there was being published a mechanical paper that could be understood.

While written for adults, Popular Mechanics has met with a most enthusiastic reception by young men and boys. In fact it seems to have alike pleased young and old and all members of the family. It is not our policy to herald the plans and improvements to be carried into execution during the ensuing year. We will only say there are some very pleasant surprises in store for the readers of Popular Mechanics.

MARCONI TELLS OF HIS ACHIEVEMENTS.

Worked Against Many Difficulties, But His Success Is a Final Vindication.

By Guglielmo Marconi.

The recent exchange of messages from Table Head to Cornwall, Eng., established beyond a doubt the complete success of wireless telegraphy. It was rather amusing to us when we read in the newspapers some time ago the rumors of failure. It was just at the time that our experiments were reaching successful conclusions. We would have been in position to transmit messages much sooner but for the delay in obtaining machinery of all kinds. We are, as you may readily see, a good deal out of the world here at Table Head, and often we had to send as far as Montreal for parts of machinery. This of course delayed us greatly. Even after the first message was sent a slight defect was found in one of the instruments and it required two days to remedy this.

I cannot tell you definitely when we will have our stations ready for commercial purposes. All that is required here is a little organizing, which is merely a matter of a short time. Some time ago, however, the English government, which controls the telegraph system of the united kingdom, refused to make connections with Poldhu stations, and this, of course, will have to be done before we can do successful commercial business.

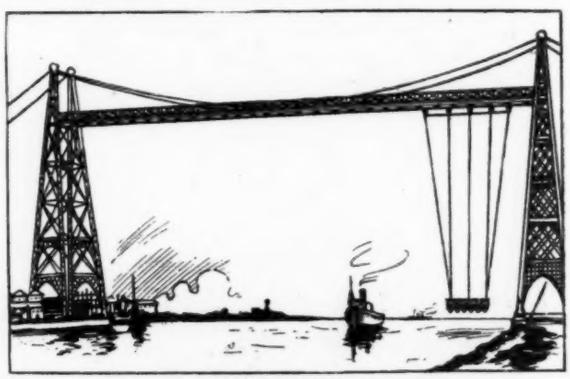
I will remain at Table Head for a short time, and then proceed to the Cape Cod station, and from there to Cornwall to make arrangements for opening my system for commercial purposes.

TRANSPORTER BRIDGE GAINS FAVOR ABROAD.

Picks Up Horses, Cars, Cabs and Passengers and Lifts Them Across the Stream.

The transporter bridge by which cars, horses, carts, cabs and pedestrians are picked up and lifted across the stream by means of steel wire cables, are gaining in popularity. The first one to be built in England has just been completed at Newport. It is to cost about $300,000.

The cars, horses, merchandise, etc., are carried across the



The "Ferry" Bridge.

stream on a great car or "ferry" suspended at road level. This "ferry" car on the Newport bridge is supended by 30 steel wire cables from a platform which runs on low rollers along the girders about 160 feet above. It is drawn from side to side of the stream by means of a winding rope and drums worked by electric motors. The towers on either side which support the suspension bridge are 254 feet high.

Persons of great stature and well constituted physically and mentally are rare. Giants are usually ill-formed and short-lived.

HOW TO SAVE.

Some sage one has discovered, and has told in verses neat,
What a lot of cash 'twould save us if we didn't have to eat.

Let me add unto this wisdom, though the thought may make you creep,
We could hoard up gold in bedclothes if we didn't have to sleep.

Furthermore, 'tis borne upon me, with a force I cannot balk,
That we'd save a lot of leather if we didn't have to walk.

So, of all the bills that vex us, just the biggest one, I guess,
Would be spared for safe investment if we didn't have to dress.

Come to think the whole thing over, free concurrence you will give,
That vast wealth would line our pockets if we didn't have to live.

—Chicago Journal.

DOCTORING BY TELEPHONE.

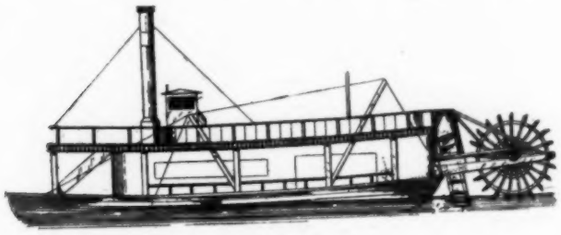
A gentleman who had resided many years in Chicago moved recently out into a suburb 20 miles away. He had the utmost confidence in his family doctor, but had little faith in any other. One night he awoke in great distress and could scarcely breathe. He sent for a local physician, who came, administered some medicine and departed. A half hour later the patient felt he was rapidly growing worse. In desperation he called up his old doctor in the city. The doctor asked a few questions, then he said, "Now put your mouth close to the transmitter and take several long breaths." The patient did so and wheezed like a pair of old bellows. "Get a pencil," came from the doctor. "Now write down what I tell you." The patient wrote the prescription as directed. "Procure the medicine at once; take it and you will be all right in the morning. Good night," and the doctor rung off.

It was now two o'clock in the morning and the nearest drug store, a mile away, and no men folks to go after it. The sick man then bethought him of his telephone, called up the drug store, telephoned the prescription which the doctor had "written so you can understand it" and soon the night clerk came tearing along on his bicycle with the stuff.

As the doctor said, the man was feeling pretty good by daylight.

STEERING WHEEL FOR BOATS.

A Kentucky inventor has built a novel attachment for river boats to enable them to be turned more rapidly. A second



Novel Steering Gear.

paddle wheel set at right angles to the propeller can be turned in either direction and thus causes the stern of the boat to move in the desired direction.

A Logansport, Ind., man recently made a thousand-mile journey in a gasoline automobile at a cost of $8.85 for oils and $10 for repairs.

CRUSADE AGAINST TOSSING IN BLANKETS.

Opponents Declare the Sport to Be More Barbaric Than Football or Other College Games.

A crusade against the old sport of tossing in a blanket has been inaugurated by the National Guard of Minnesota. During an encampment at Little Falls, Minn., members of a company composed almost entirely of manual training school students were engaged in the popular sport at the expense of their com-

"Photo-Beacon" Photograph of Blanket Tossing.

rades when the colonel of the regiment unexpectedly came upon them. High above the highest tents and above the flag staffs one of the men was being hurled while the soldiers shouted in glee. The colonel stood aghast at the sight for an instant and then he ordered an immediate cessation of the reckless sport. It has since become known that several accidents have resulted from the common practice among the various companies and steps have been taken to prohibit such form of amusement in the future. Its opponents declare it to be far more dangerous and barbaric than college rushes, football, bull-in-the-pen or any such rough games.

FIXES NUMBER OF PASSENGERS.

In all European cities the maximum number of passengers that a car or omnibus may carry is fixed by a law which also requires that the number be painted prominently on the vehicle, and provides a penalty for permitting the entrance of persons in excess of that number. The result of this police regulation is that the carrying companies provide adequate facilities.

The mortality in the colored population in the United States is nearly double that of the white population.

Easy Electrical Experiments

By L. P. Dickinson

HOW TO DO ELECTROPLATING AT HOME. PART III.

When a body which has been nickel plated comes from the plating bath, it does not have the brilliant appearance so common to nickel plated articles. This brilliant appearance is only secured by careful polishing. Sometimes, too, the deposit is marred with blotches and "burned" spots. This is caused by

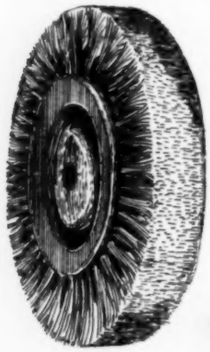


Fig. 1.

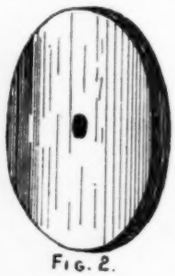


Fig. 2.

Fig. 3

too strong a current, or by leaving the articles immersed too long, or perhaps by allowing one portion of the article to remain too near the immersed plate of nickel.

The process of polishing is quite easy, if the plater be provided with a polishing lathe, or with any suitably mounted polishing wheel, driven by foot power or otherwise. The polishing brush shown in Fig. 1 is commonly made of bristles, mounted in a suitable hub, so as to revolve at a high rate of speed. The work to be polished is held against this revolving brush. Often, too, a polisher, or "buffer," is made by clamping upon a spindle a large number of circular discs cut from muslin or canvas, or thin leather. When revolved at a high rate of speed, the discs which ordinarily are soft and yielding, stand out stiffly because of centrifugal force, making a stiff wheel against which the work is held.

To aid in the polishing various compounds may be applied to the surface of the revolving buffer. These are usually called by the general name of "rouge." They may be bought in sticks at dealers in plating supplies. There are hard and soft rouges, for coarse and for delicate work, as well as dry rouges and greasy rouges.

But the amateur without special tools will have to polish the articles as best he can by hand, unless he can improvise a lathe. A great deal can be done with a piece of soft canton flannel upon which rouge or whiting has been rubbed. Both these substances are common in the market under the name of "silver polishes." Begin with a coarse rouge, and after the roughest part of the work is done, use a finer rouge. Then, using a clean piece of flannel, rub to a final polish with whiting. An old soft tooth brush is excellent for getting into corners, or a piece of flannel mounted upon a smooth stick.

Silver plating can be done very nicely without the use of a battery. A simple immersion of the article to be plated in the proper bath will give an excellent deposit. A solution for this purpose will now be described. The solution is especially applicable to such articles as watch chains, teaspoons, brooches and other small articles of jewelry.

Procure four ounces of chloride of silver, twelve ounces of common washing soda, and five ounces of common salt. Mix these together with warm water so as to form a paste about as thick as heavy cream. The mixture is applied to the surface of the article to be plated by rubbing it upon the article by means of a piece of cork, or a piece of flannel tied upon a stick. All parts should be uniformly silvered. Of course the article must be cleaned and washed as explained in the first paper, and the paste is applied while the article is wet. Soft tooth brushes are useful in this work also. The work when done should be dried by rolling in sawdust and wiped dry.

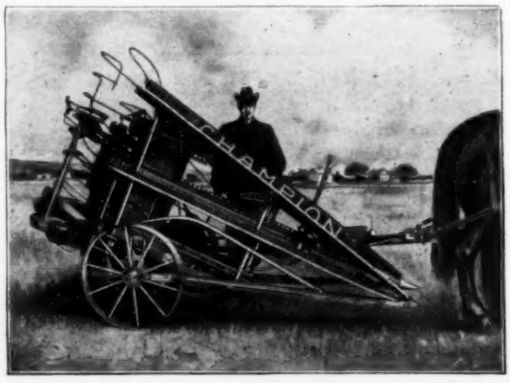
In replating old articles which have already been plated, care must be taken in the preliminary polishing and cleaning, to see that all rough edges are smoothed down. Ordinary hand scrub brushes, Fig. 3, are not at all bad for rough cleaning, and a bristle brush with crocus powder, or dry rouge, will do for the final polish.

For extensive work, a small dynamo built for electroplating is necessary. For copper plating an electro motive force of two or three volts is sufficient, with moderate current. Nickel plating requires from four to six volts, and a much stronger current.

UNIQUE CORN BINDER.

A new corn binder that has been placed on the market by the Champion division of the International Harvester Company

of America is unique in its mechanism and method of operation. It clears the corn field as it is pulled through, cutting down the stalks and binding them up with remarkable celerity. It is an



odd looking two-wheeled contrivance, being shaped not unlike bellows on wheels.

Acetylene has been experimented with for signaling in the German army, with great success. Mixed with a certain percentage of oxygen it can be plainly seen at daylight at a distance of five miles and fifteen miles at night.

It has been decided to establish wireless telegraphy apparatus on all stations and on all passenger trains on Italian railroads.

RULES FOR AIRSHIP RACES.

Speed Limited to Twenty Miles an Hour—First Prize to Be $100,000.

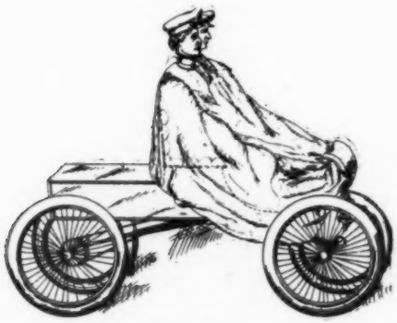
Rules and regulations to govern the airship tournaments at the World's Fair state that the contest is for airships, balloons and kites. Of the $200,000 appropriated there will be a first prize of $100,000, also minor prizes. There will be no limit to the number of competitors. The balloons and airships must carry one passenger each, and the competitor must have made a trip of not less than a mile with a machine similar to the one entered in the contest. The entrance fee is $250, which will be refunded when the entries appear on the day of the races. The entire course must be traveled three times at a speed of not over twenty miles an hour. The course will not be less than ten miles nor more than fifteen miles in length. The contests will take place between June 1 and September 30, 1904.

BUILD RUSSIAN CHURCHES.

Russia is building magnificent churches in all the important cities of the world. The one in New York was dedicated a short time ago and by an archbishop who could not speak English. A Russian church in Paris, which is nearly completed, rivals in magnificence the finest churches of that city.

STORM APRON.

These people are not going to be executed or have their hair cut, although many who run automobiles deserve both.



Storm Cape.

The cut shows the latest storm cover which fits lightly around the neck keeping out wind and wet.

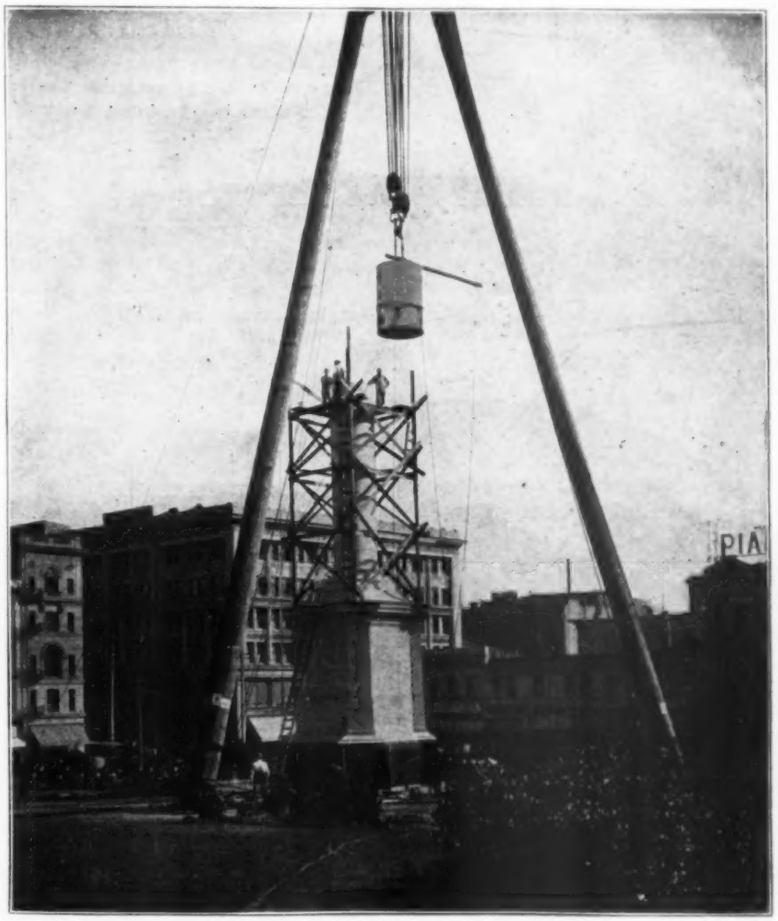
GERMANY'S GREAT GROWTH.

The German empire, until 30 years ago, was one of the weakest nations financially, but now, instead of being in need of foreign capital, Germany is following the example of England and France, and is loaning and investing money in foreign countries. According to a recent semi-official statement, there are about $2,000,000,000 of German capital invested in the United States and Mexico. It is estimated that another $2,000,000,000 are invested in Central and South America, some $250,000,000 in Turkey, and about $1,000,000,000 in Africa, Australia and the Far East.

GRAND MONUMENT TO DEWEY.

Shaft in San Francisco, Each Stone of Which Weighs 20 Tons.

Each block of stone being used in the erection of the great granite shaft at San Francisco to commemorate Admiral Dewey's victory at Manila bay weighs 20 tons. The shaft will be 85 feet high and 5 feet 8 inches in diameter. Immense timbers from Oregon, more than 100 feet long, were used to lift the stone work. The shaft will be surrounded by a bronze figure of Victory by Sculptor Aitken. The monument will stand in Union square, one of the prettiest and most popular spots in the city of San Francisco.



Laying the 20-Ton Stones in the Building of the Dewey Monument.

AWFUL INERTIA OF HEAVY AUTOMOBILE.

The many accidents recently from fast speeding in France have caused M. E. Hospitalier to give, in La Locomotion, some interesting facts as to the inertia of a 2000-pound automobile traveling at the rate of seventy-five miles an hour, and the braking power required to stop it. Calculation shows the inertia of the vehicle to be the same that it would have if it fell a distance of 196 feet. This energy is equivalent to that of a complete train on the Paris underground railway, traveling at its highest speed. When a brake is applied capable of a resisting effort of 551 pounds per ton at the rim of the wheels, the retarding power of this brake is, during the first instants, equivalent to 113 horse power. And all this terrific strain is transmitted through the frail pneumatic! Still few accidents are caused by bursting tires.

FROM PARIS TO PEKIN.

A through train service from Paris to Peking was arranged some days ago by the directors of the Nord, Quest and Orleans railway companies of France and representatives of Belgium, Dutch, German and Austrian railways.

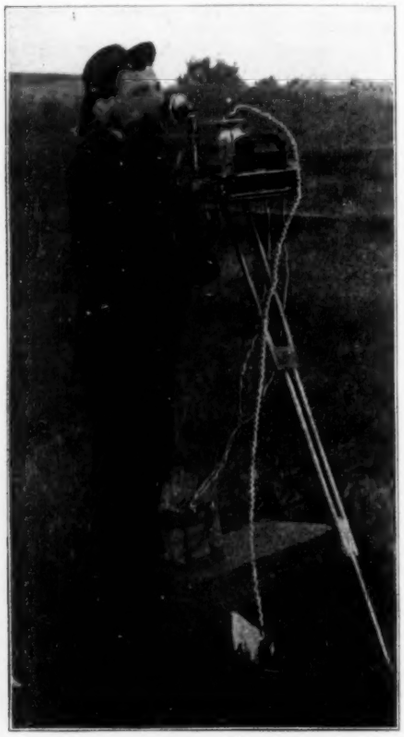
What is the greatest engineering feat on record?

Wheeling, West Virginia, on the river.

TELEPHONING WITHOUT WIRES.

By This System Messages May Be Sent Through the Earth or Sea.

Editor's Note—While Marconi and others are using the air for a telegraph line, experiments in sending telephone messages through the earth and sea are being perfected. A. F. Collins, who has been working several years on wireless telephones, tells in the Electrical Review of his progress. For the army and navy in time of war this system will prove of great value. A spy can creep into the enemy's lines, stick a copper plate into the ground and proceed to report all he sees to his commanding officer several miles distant. For communicating with wrecks, and between vessels at sea, it will be the greatest advancement in navigation in many years.



Sending and Receiving a Message.

By A. F. Collins.

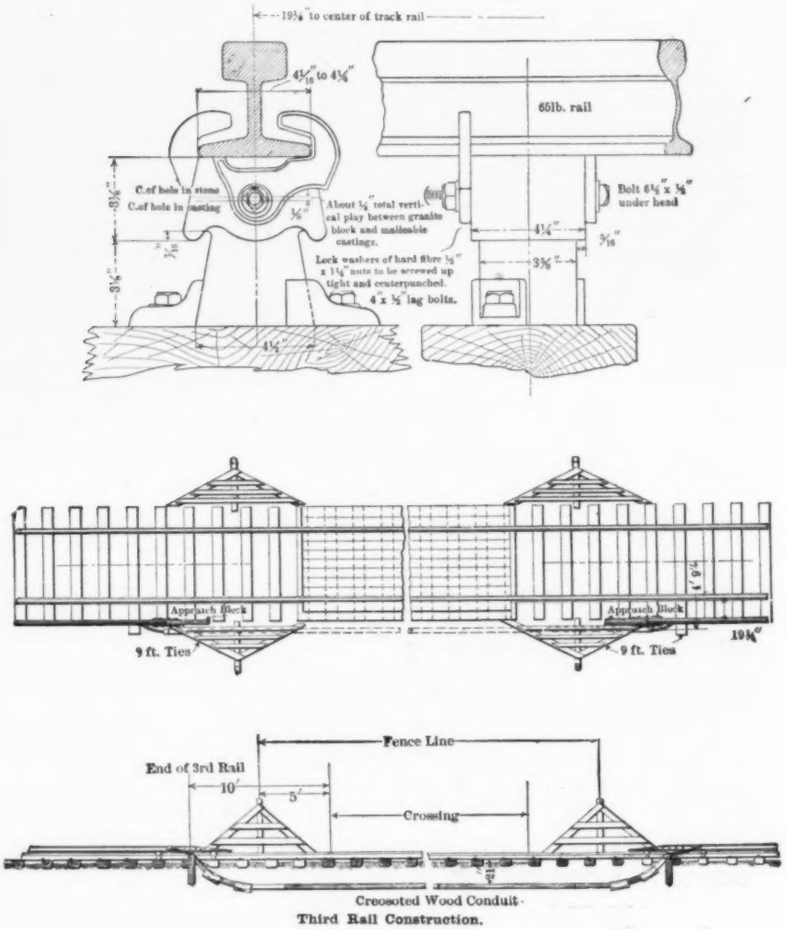
The value of wireless telephony lies in its application to speech transmission between vessels, supplanting the time-honored and hoary steam whistle. It may be used in isolated cases where bodies of water intervene and where cables would prove too expensive. It may be used where the right of way can not be obtained for erecting poles or stringing wires; there are a thousand places where it will be welcomed, but as a block signal system for vessels in harbors it will, in my opinion, find its proper sphere of usefulness.

My wireless telephone may never supplant the wire system now in use, but it can to-day be employed where the wire telephone can not be used—on the water and other inaccessible places. Nearly all wrecks are the result of colliding vessels in harbors, due to a misunderstood signal. But when these vessels are equipped with my system—as I hope they may all be soon—the captains will be placed in the same relative position as the modern business man, and they will be able to communicate with each other while sitting in their cabins or from the bridge, instead of relying on a system of signaling that should be relegated to the dead past.

Electric Railway Series, Part I—How the Third Rail System Operates

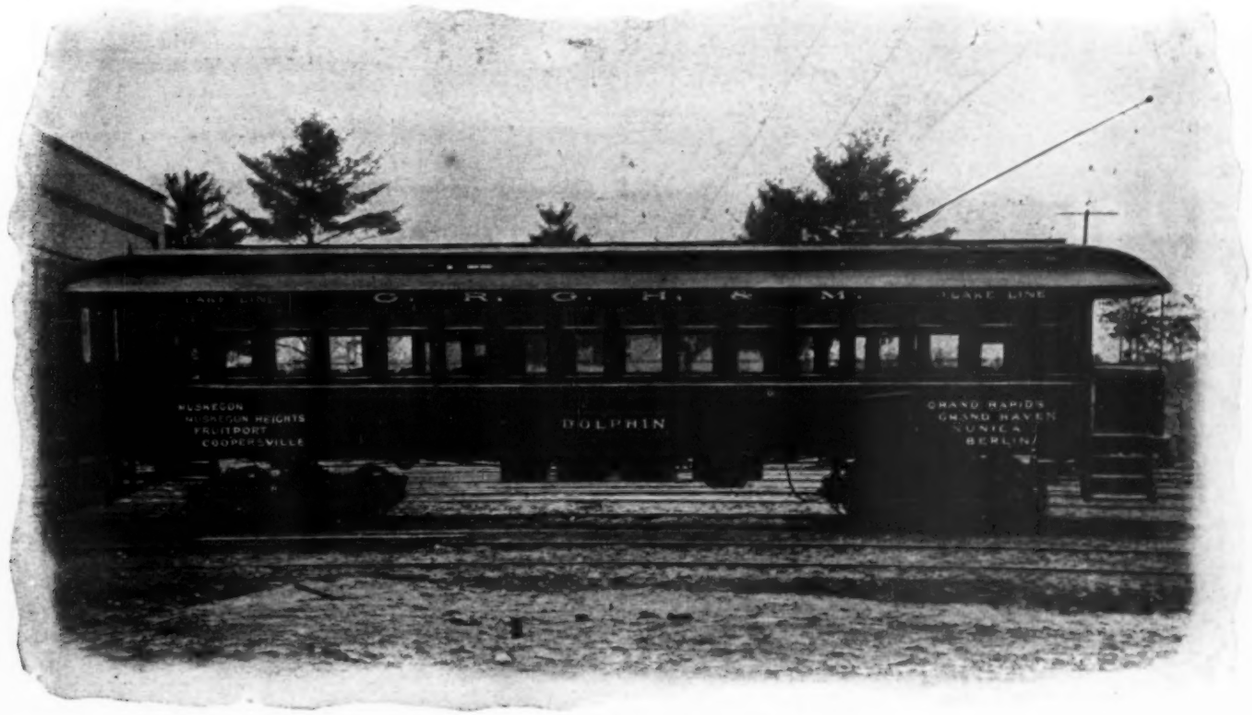
Electric Current is Conducted Through a Rail on the Surface Instead of by Trolley Wire High in Air

Electric railways now being built outside of city lines are generally using what is known as the "third rail" system. The difference between this type of electric railway and the more familiar "trolley" line, is in the manner of conducting the electric current from the power house to the cars on the line. This is done by laying a third rail of the same character, and usually the same size, as that laid in the track for the cars to run on. The third rail is raised six inches above, and placed eighteen inches outside one of the track rails and rests on every fifth tie which is made extra long for the purpose. To prevent the current flowing to the ground the rail is insulated by blocks of some insulating material made specially for the purpose. Instead of the trolley pole and wheel running along under a trolley wire a "shoe" extends out from the car and slides along on the live rail and through the shoe the current passes to the motors. The advantages are higher speed and no danger of wires and poles falling down in storms. The third rail construction costs twice as much as the overhead wires. All the third rails are connected at the ends, one to another by copper wires and fish-plates to afford easy passage of the cur-



Third Rail Construction.

rent. Where the track crosses a highway the third rail is not used, but the current is conducted on heavy copper wires laid underground in a wooden tube. As the third rail is charged with a heavy current of electricity, one would receive a severe and perhaps fatal shock, should he come in contact with the third rail and one of the track rails at the same time. The illustrations are made from the new road between Grand Rapids, Mich., and Muskegon, which is equipped throughout with Westinghouse apparatus, and is pronounced a very fine piece of construction. The passenger cars are 52 feet long, seat 56 persons, have motors of 300-horse power, and will travel 60 miles an hour.



60-Mile-an-Hour Electric Car, showing the Contact "Shoe."

ENCOURAGING SPONGE GROWING.

The United States Fish Commission experts are at work among the Florida keys trying to get sponges to growing more satisfactorily there. At present five different varieties of sponges are found off the South Florida coast, and it is believed that the sponge industry is in a fair way to be greatly extended.

LEASE CHINESE GOLD LAND.

A Russian company, formed at Vladivostok, has leased from the Chinese administration three-fourths of the entire tract of land upon which gold has been found in Kamchatka. The Chinese will receive 15 per cent of the gross yield, and will maintain a guard of 200 men.

THE SAND BRICK A FAILURE.

Patents of a Doubtful Character.

A few months ago Popular Mechanics published an illustrated description of the new German process of making brick in a few hours from sand and lime. The reports from Germany indicated a great revolution in brick making. Letters came pouring in from all parts of the country asking for any additional information. A communication from U. S. Consul Dederick, at Bremen, just received, states the process is proving a disappointment. He says: "There have been not less than 80 factories erected in Germany for the manufacture of sand brick. That the patents covering such systems are not very valuable is clear from the fact that a large firm not far from here publishes a catalogue offering to tell anybody and everybody just how to make sand-lime brick and to furnish all the machinery necessary to make them. In fact the catalogue presents gratis a number of plans and specifications for erecting and equipping factories for the purpose of making sand-lime bricks, and, as far as I can ascertain, these bricks can be safely manufactured without securing any patent rights.

As to the merits of the sand-lime brick itself, the opinions of the experts do not agree. Altogether, the brick, in the long run, does not seem to give the satisfaction it promised. To begin with, the plant necessary for its manufacture, with all its various apparatus and furnaces and hardening cylinders and the quantity of fuel required, is very expensive. And even when a fairly good sand-lime brick, as to weight and color, has been turned out, it is generally found that it is not much of an improvement over the old-time clay brick; while the former retains most of the objectionable features of the latter, it has but few redeeming qualities if its own. Therefore, it is not surprising to learn from time to time that another brick factory, recently started, has again shut down because it was found that the sand-lime brick cannot be made as cheaply as the clay brick, and therefore cannot compete with it in the open market as building material.

The latest invention here in the brick line is "Quarzitol." It is also made of sand, but is strong, water and fire proof, and the broken pieces can be ground up and used again. It can be polished to imitate marble, and the material is also suitable for making crockery.

Mrs. Newlywed was doing her marketing.

"How are your kidneys this morning?" she asked the butcher's boy.

"Fine," replied the boy. "How's yourn?"

An Irishman was walking with a friend past a jewelry shop. The window was filled with precious stones.

"Wouldn't you like to have your pick?" asked Larry.

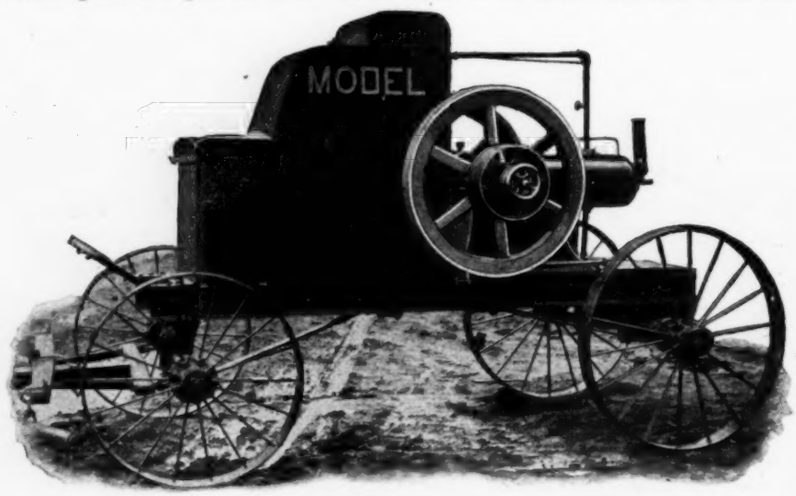
"Not me pick," said Mike, "but me shovel."

SHOP NOTES

PORTABLE GASOLINE ENGINES.

A Small Power Plant on Wheels.

Improvements in gasoline engines during the past few years have resulted in producing machines that are quite as reliable as steam, and vastly easier and cheaper to operate. The very large demand for a practical gasoline engine of a few horse power, that can be easily moved about, can now be supplied by the Central City Iron Works, of Stevens Point, Wis. Several sizes are made, the one illustrated being of 8 horse power. It is a complete power plant on wheels, which a team can easily draw about, and which is ready for instant use on arrival at destination. This company also has succeeded in perfecting an engine which will not only use kerosene, but will work with almost any crude oil. Most of the springs and "fixings" found on the ordinary gas engine has been done away with, and the result is a machine, strong and simple, that does not get out of order, and does not require an expert to keep it going.



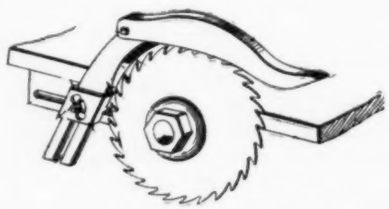
Portable Gasoline Engine

SAFE WAY TO THAW FROZEN GIANT POWDER.

The safest way to thaw frozen powder is in a covered can immersed in water, the temperature of which, at first low, is gradually raised to 70 or 80 degrees, says the Mining Press. This may be accomplished in a variety of ways, as has been previously explained in this paper. One safe and inexpensive method is to provide an ordinary oil barrel with two pipes, one inserted in the side of the barrel near its top and the other near the bottom. These pipes should project outward several feet and be connected with each other by a third piece arranged vertically. A fire may then be built under the lower pipe at a distance of 4 or 5 feet from the barrel, which is filled with water to a depth sufficient to cover the upper pipe. The frozen powder in a suitable can is then placed in the water and secured so it can neither sink nor overturn. The can should then be covered, and the heat of the fire will gradually raise the temperature of the water in the barrel and with it the temperature of the powder. This is accomplished so slowly that there is then no more danger in handling the powder than during a day in the spring time.

GUARD FOR CIRCULAR SAWS.

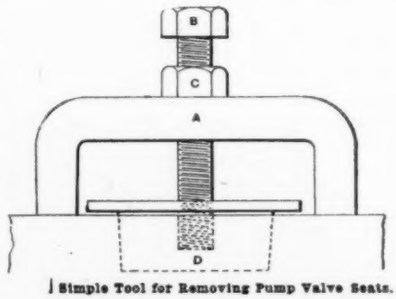
In spite of the time honored advice not to monkey with the buzz saw, the papers continue to record accidents in mills where circular saws are in use. A Dayton, O., man has invented a guard which should lessen these accidents to some extent at least. The guard can be set to fit the size of saw in use and hangs over the saw without touching it.



Circular Saw Guard

TO REMOVE VALVE SEATS FROM PUMP CHAMBERS.

The accompanying illustration shows a tool that can be made very easily at a forge and that is exceedingly handy in removing valve seats from pump chambers. It is made from ½-inch iron, 1½ inches wide, and a bolt and nut threaded the same size as the valve stem, says a contributor to the Engineer. A hole is made through the yoke A, large enough to allow the threaded part of the bolt B to slip through freely. With the rig in position as shown, screwing down on the nut C lifts the seat D out without any trouble.



Simple Tool for Removing Pump Valve Seats.

HAVE A CARD INDEX.

In these days a man cannot begin to remember everything it is necessary or desirable he should know, and the wear on his brain would not pay to do it even if he could. The young man who starts in to accumulate valuable information will have a valuable library of reference in a few years. The great difficulty has always been how to find what one has saved. For instance you have a distinct recollection of a certain article, just what you need today the worst way, which you read two years ago, and saved. But what was it in?

You can easily turn to it in an instant with a card index. Buy or cut out some cards about 3x5 inches which you can keep in a small wooden box you can make. When you come across something worth knowing fill out one of the cards something like this:

STORAGE BATTERY.
How to Make, Illustrated.
Popular Mechanics,
March 22, 1902.
Home-made—Suitable for light work—cheap—good.

At the time you make the card you put away that issue of the paper, or the page containing the article in your collection of matter, or if you bind your volumes, you can in either case easily find what you desire. The time required to look over the cards, which are placed in the box alphabetically, is but an instant. You can add to your cards indefinitely and when certain subjects become out of date throw away the matter and remove the card from the box. You will be surprised to find what a wealth of valuable information can be gathered in this way, and it becomes more valuable every year.

SIMPLE AND USEFUL HOME-MADE TOOLS.

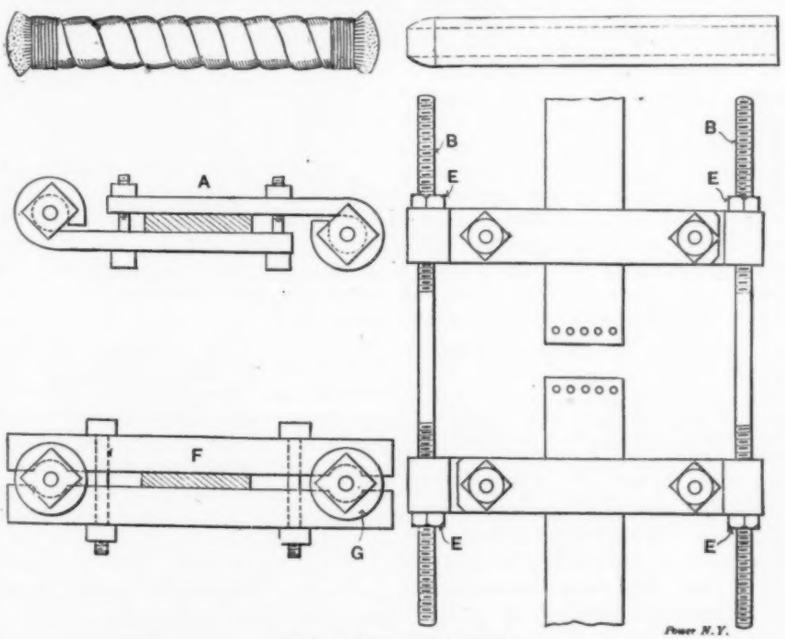
A piece of 4-inch rope, 5 or 6 inches long, whipped on both ends, as shown in the left-hand sketch, is advantageously used with the polishing paste when cleaning hot surfaces such as valve bonnets on our Corliss engine. By putting a little paste on the end of the rope, says a writer in Power, we can give the bonnet a good scrubbing without burning our hands.

The other top figure is a handy tool to use when cutting bolt holes in gaskets when it is not convenient to use a keen hammer and cut them out against the pipe flange. It is made of a piece of pipe 6 or 8 inches long, and of any size desired. One end is to be filed or ground down to an edge, as shown in the sketch. It can also be used for cutting washers out of sheet lead, or a piece of ⅛-inch pipe could be sharpened for punching holes in the ends of a belt for the lacings.

Speaking of lacing belts, here is a home-made belt stretcher, which we have used with satisfaction. It is made of four pieces of ½x1¼-inch iron, each bent around on one end to form a loop large enough to take a ⅝-inch bolt.

Two of these pieces are bolted together to clamp the end of the belt, as shown at A, Fig. 2. With these clamps on each end of the belt, the bolts B can be put in place, and by screwing up on the four nuts E the ends will be brought together for lacing.

If it is more convenient, the clamps could be made of hardwood, as at F, instead of iron. When using the wooden clamps it will be necessary to have four large washers, as at G, to protect the wood from the nuts on the drawing bolts.



Handy and Easily Made Tools

POURING A CASTING.

Modern methods are a great improvement over the old way of making a casting. Instead of a bunch of men tugging at the iron frame which held the flask of molten metal with the ever present danger of misstep causing some one to fall and overturn the liquid fire, we find one man deliberately doing the entire work. A conveying vessel is suspended from a trolley and run along to the mold. Then the operator turns it in evenly and surely until the mold is filled. The scene is one selected by the Photo Beacon, as a prize picture taken under difficult conditions.

One Man Pouring a Casting

HOW STEAM RAILROAD MEN REGARD ELECTRICITY.

While electricians and the general public are looking forward to the day when the steam locomotive will be a thing of the past, we do not hear much from railroad officials. At the same time while they are not talking they are actively thinking. That they do believe such a day is coming is evidenced in an editorial in the Railroad Gazette, a very conservative paper. In commenting on the new lines between Washington and Baltimore, described recently in Popular Mechanics, the Gazette says: *In the present state of the electrical art*, heavy, long distance business, handled in large and infrequent units, can be done cheaper by steam than by electricity. We think that the really well-informed engineers agree in this opinion, but the words italicized must be read carefully. The state of the electric art will not be in its present state five or ten years from now. Nothing in the whole field of engineering is more certain than this. The uses of electricity as a means of transmitting and applying energy will be multiplied in ways that the most daring imagination does not foresee."

TO TRANSFER IMPORT COAL TRADE.

The scheme of French capitalists to transfer the import coal trade of Mediterranean and African ports from England to the United States by building coal steamers to the value of $20,000,000, will be aided by the $1.50 a ton bounty on coal carried on French bottoms, while England charges 24 cents a ton export duty.

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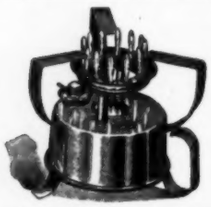
Tiny Alcohol Stove is a Marvel
Burns gas from the alcohol and generates its own gas



Glogau's Alcohol Gas Stove
(Made in Germany)

Can be carried in a corner of a small grip and gives heat equal to a regular gas stove. No danger of spilling alcohol from being capsized. It is absolutely safe, wonderfully substantial and economical in consumption of fuel. The most servicable novelty of the day. Sent anywhere, express prepaid for $1.00 Agents wanted. GLOGAU & CO., 17 Quincy St., Chicago, Ills.

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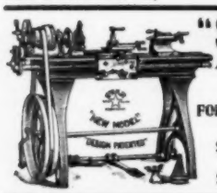

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EXACT SIZE.

SMALL ANIMALS
For Favors, Charms and Art Cabinets.
Perfect in design and heavily plated in gold or silver.
Your choice of the following: Horse, Buffalo, Donkey, Fox Terrier Dog, Cat, Bear, Belgian Hare, German Dachshund, Rabbit and Monkey.

Prices, by Mail, Postage Prepaid.

GOLD PLATED.		SILVER PLATED.	
One	20c	One	15c
Two	35c	Two	20c
Three	50c	Three	25c
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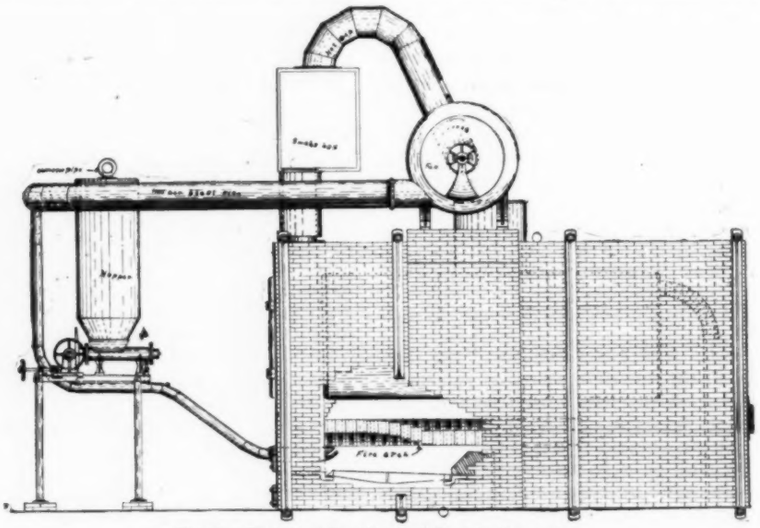
Coal Dust Affords Ideal Combustion

System of Burning the Powdered Fuel in Suspension Described--Great Economic Gain

By C. O. Bartlett.

Powdered coal is attracting a great amount of attention at present and the wonderful success that has been experienced with it presages that this is unmistakably the form of fuel of the future for nearly all kinds of manufacturing purposes. The E. L. Rowe process of burning powdered coal in suspension has thoroughly demonstrated its great superiority for boilers of all kinds, brick and lime kilns and other furnaces. The illustration shows this system. A test carried on for six months showed a gain in the horse power of the boiler of 20 per cent and an economic gain of 30 per cent as compared with the old method of hand firing. We get perfect combustion, there being no black smoke whatever rising from the stack, nothing but a light gray mist or vapor, similar to that which comes from a coke fire.



Showing Process of Burning Coal Dust in Suspension

The coal is first dried on a rotary dryer down to about 2 per cent moisture, then ground in a pulverizer down to 80 mesh fine and the ground coal is then elevated and stored in an iron storage hopper above or near the boiler. An air pipe is connected with the feeder spout at the furnace and above the boiler in the breeching or stack and connected to a blower fan of sufficient size to furnish the necessary air for burning the coal dust which gives it a perfect circulation.

The coal is conveyed by a special conveyor from the bottom of the storage bin to a spout. The speed of this conveyor controls the amount of coal used and can be changed at a moment's notice by turning a hand wheel, that is, to feed faster or slower according to the amount of fuel desired. From the conveyor the coal is fed direct to the air spout. There is a nozzle on the inside of the air spout which concentrates the air just as it strikes the coal as it comes down from the conveyor which gives a thorough mixture of the coal with the air and at the same time prevents any danger of clogging. The coal is caught by the current of air and blown along the air spout to the furnace spout. Just before entering this spout there is another nozzle which again concentrates and mixes the air with the dust just before it enters the feed spout. This feed spout is made of cast iron and has a semi-circle opening or mouth, so as to spray the coal dust up and against the arch wall, where it is ignited and burned in suspension. This spout is covered with fire brick for protection and the current of air continually passing through it also protects it from burning out. There is nothing about this system which is not very durable. There are slides or valves on the different places in the air pipe so as to admit just enough air to get perfect combustion, all of which are under the complete control of the operator.

The ordinance for the Pennsylvania tunnel into New York was carried by a majority of but one vote.

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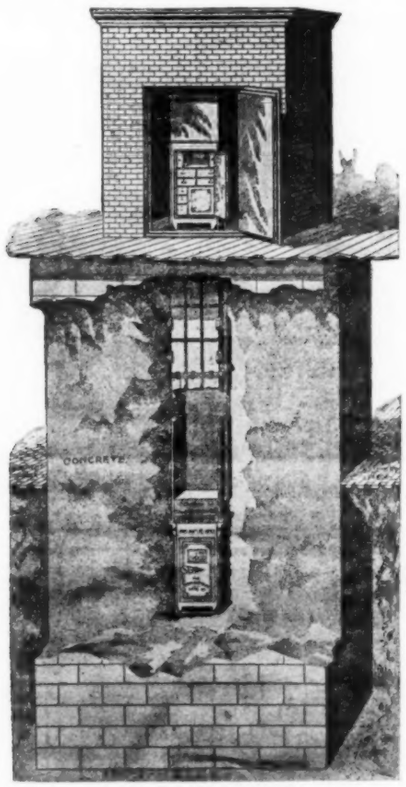
REAL BURGLAR PROOF SAFE.

Chest Lowered Into Metallic Lined Concrete Subvault Deep in the Ground.

Lowering the safe into an impenetrable mass of concrete sunk deep into the ground underneath the building is a new scheme of protection from burglars that is in use in Newburg, Ind., where robbers in past years have found a lucrative field. The Citizens' bank of that city is the first in-



Safe Buried in Concrete Subvault

stitution to put the new system into effect. It seems that the contrivance has about settled the long discussed problem of the perfect burglar-proof safe. It defies dynamite, nitro-glycerine, sledges and chisels. The subvault into which the safe is lowered is metallic-lined and surrounded by solid walls of masonry and concrete, fastened down by heavy steel lugs operated by a triple time lock. It cannot be raised for any purpose until these lugs are released automatically and at the desired hour. The burglar who tries to rob this bank will have to tackle a mass of concrete ten by ten by sixteen feet. If a discharge of dynamite occurred the debris of concrete falling around and over the safe would protect it more than ever. The building and all would have to be blown to atoms and then the money in the safe could not be reached.

A pension system has been established by the Canadian Pacific railroad for superannuated employes.

OUR NEW PAVEMENT.

They took a little gravel
And they took a little tar
With various ingredients
Imported from afar.
They hammered it and rolled it
And when they went away
They said they had a pavement
That would last for many a day.

But they came with picks and smote it
To lay a water main;
And then they called the workmen
To put it back again.
To run a railway cable
They took it up some more;
And then they put it back again
Just where it was before.

They took it up for conduits
To run the telephone;
And then they put it back again
As hard as any stone.
They took it up for wires
To feed the 'lectric light,
And then they put it back again,
Which was no more than right.

Oh, the pavement's full of furrows;
There are patches everywhere;
You'd like to ride upon it,
But it's seldom that you dare.
It's a very handsome pavement;
A credit to the town;
They're always diggin' of it up
Or puttin' of it down.

—Washington Star.

BARBER SHOP COMEDY.

A Concordia, Kan., woman, who was in a great hurry to catch a train, rushed into her husband's store to kiss him good bye. Being told that he was getting a shave in the barber shop next door, she flew into the shop, imprinted a catch-as-catch-can salute on the lather-covered face of the man in the chair, admonished him to write every day, and then boarded her train in blissful ignorance that her husband had viewed the performance from the chair next to the other bewildered man.

THE "AUTOMO" OF KOKOMO.

An automobile stanhope leading the grand march in a line of 119 couples was a novel feature of a grand ball given at Kokomo, Ind., recently by the employes of the Haynes-Apperson Co. The stanhope was occupied by Mr. and Mrs. Elwood Haynes. As the auto glided along at the head of the gayly costumed procession that tramped in time to the stirring strains of superlative band music, the scene and environments were peculiarly inspiring. Now they are singing in Indiana:

O! you 'auto' go to Kokomo
And see the grand march 'Automo,'
That 'Automo' of Kokomo
That led the blissful belles and beaux.
Mokotaumo Komautako, Autokomo!
Koko Koko, Hoho Hoho,
The Automo of Kokomo.

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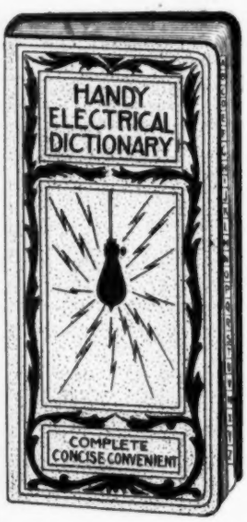

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